Materials Scientists Help Trim F-18's Engine Dorsal Cover Costs by Nearly Half

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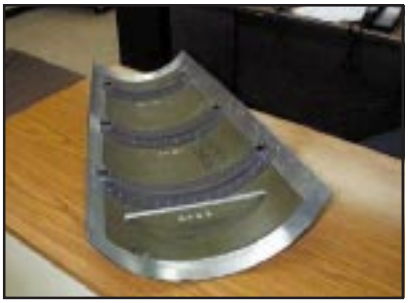

Payoff

The successful adaptation of the automotive P-4 process to aerospace applications will result in a more efficient and cost-effective process for chopping and spraying complex carbon fiber preforms. The P-4A research effort has proven successful in the F-18E/F structure and could lead to substantial cost and part weight reductions in other selected structures, as well. The combined research effort also demonstrates by working together, the automotive and aerospace communities can make significant gains in composite parts manufacturing processes.

Accomplishment

Scientists at the Air Force Research Laboratory's (AFRL's) Materials and Manufacturing Directorate (ML) have worked with U.S. aerospace companies, the University of Dayton Research Institute (UDRI) and the National Center for Composite Systems Technology (NCCST) to develop technology that will reduce the cost of the Navy's F-18 engine dorsal cover by 47 percent and reduce it's weight by eight percent. Their achievement demonstrates the Programmable Powder Preform Process (P-4), used to spray fiberglass preforms in automobile manufacturing, can be adapted to aerospace structures made from carbon fibers with dramatic results. Preliminary research suggests their modified process, P-4A (Aerospace), may lead to significant cost reductions in the Air Force's C-17's tail cone assembly program. Continued research could lead to even greater savings in the military and commercial sector through improved aerospace composite processing techniques.

Background

In recent years, there has been an increasing trend in aerospace and defense industries towards reducing the cost of composite parts manufacturing, even during low-volume production, while producing components of technically superior quality. One way to achieve this is through technology sharing between the aerospace and automotive industries. P-4, developed by Owens-Corning and identified by the Automotive Composites Consortium (ACC) for spraying chopped fiberglass preforms for subsequent resin infiltration, is fully robotized and automated, offers low waste, short cycle times and high consistency and control, and can spray up either random or oriented fiber distributions. Researchers at ML recognized the tremendous potential for lowering costs by adapting P-4 to aerospace composites manufacturing. Their vision eventually led to the creation of a special research team comprised of representatives from Boeing Seattle, Boeing St. Louis, Lockheed Martin, Northrop Grumman and UDRI, led by the NCCST, based in Dayton, OH. The ACC participated by ensuring effective communications between the aerospace and automotive communities. The research team's primary objective was to assess the applicability of the low-cost discontinuous fiber preform fabrication P-4 technique to aerospace structures, then modify the process to work with carbon fibers instead of fiberglass. Experience gained from P-4A research may be applied to future programs, resulting in additional savings for the Air Force, Navy and other military services, as well as, U.S. aerospace, automotive companies and industry at large. The P-4A project also resulted in the development of a reliable model, shared by research team members, to cost and rank structural concepts and select demonstration articles.